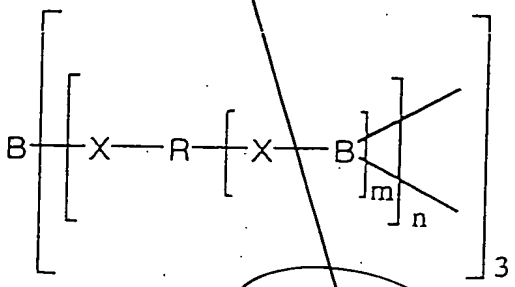
CLAIMS

1. An ion-conductive polymeric compound, characterized in that one or more boron atoms are present in a polymeric structure.

2. The ion-conductive polymeric compound according to claim 1, characterized by being represented by the following general formula (1).



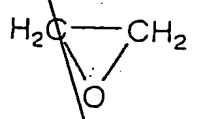
(1)

wherein X represents a hetero-atom, R represents a divalent to hexavalent group having a molecular weight of at least 150, m represents an integer of 1 to 5, and n represents a recurring number of 1 or more.

3. The ion-conductive polymeric compound according to claim 1 or 2, characterized in that the hetero-atom represented by X in general formula (1) is an oxygen atom.

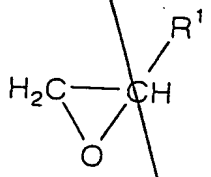
4. The ion-conductive polymeric compound according to any one of claims 1 to 3, characterized in that the group represented by R in general formula (1) is a polymer or a copolymer of compound (A) represented by the following formula (2) and/or compound (B) represented by the following formula

(3). compound (A)



(2)

compound (B)



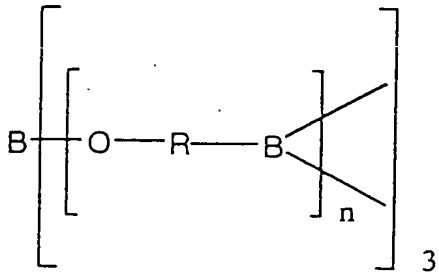
(3)

wherein R^1 represents a methyl group, an ethyl group, a propyl group, a butyl group or a group represented by the following formula (4)

$$-CH_2-[-CH_2CH_2O-]_r-Ra \qquad \text{formula (4)}$$

wherein r represents 0 or an integer of 1 or more, and Ra represents a methyl group, an ethyl group, a propyl group or a butyl group.

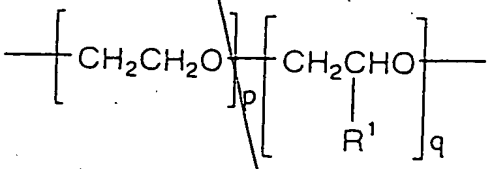
5. The ion-conductive polymeric compound according to any one of claims 1 to 4, characterized by being represented by the following general formula (5).



(5)

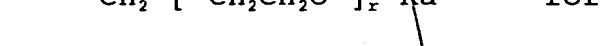
wherein R represents a divalent group having a molecular weight of at least 150, represented by the following

formula (6), and n represents a recurring number of 1 or more.



(6)

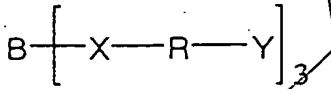
wherein R^1 is a methyl group, an ethyl group, a propyl group, a butyl group or a group represented by the following formula (4), p represents an integer of 0 to 38,000, and q represents an integer of 0 to 28,000, provided p and q are not 0 at the same time.



formula (4)

wherein r represents 0 or an integer of 1 or more, and Ra represents a methyl group, an ethyl group, a propyl group or a butyl group.

6. The ion-conductive polymeric compound according to claim 1, characterized by being obtained by crosslinking a compound represented by the following general formula (7).



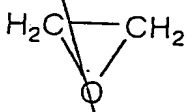
(7)

wherein X represents a hetero-atom, R represents a divalent group having a molecular weight of at least 150, and Y represents a polymerizable functional group.

7. The ion-conductive polymeric compound according to claim 6, characterized in that R in general formula (7) is a polymer or a copolymer of compound (A) represented by the following formula (2) and/or compound (B) represented by the

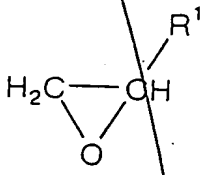
following formula (3).

compound (A)



(2)

compound (B)



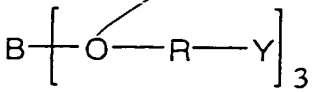
(3)

wherein R^1 represents a methyl group, an ethyl group, a propyl group, a butyl group or a group represented by the following formula (4)

$$-CH_2-[-CH_2CH_2O-]_r-Ra \qquad \text{formula (4)}$$

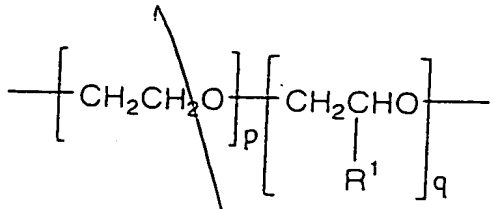
wherein r represents 0 or an integer of 1 or more, and Ra represents a methyl group, an ethyl group, a propyl group or a butyl group.

8. The ion-conductive polymeric compound according to claim 6 or 7, characterized in that the compound represented by general formula (7) is represented by the following general formula (8).



(8)

wherein R represents a divalent group having a molecular weight of at least 150, represented by the following formula (6), and Y represents a polymerizable functional group.



(6)

wherein R^1 represents a methyl group, an ethyl group, a propyl group, a butyl group or a group represented by the following formula (4), p represents an integer of 0 to 38,000, and q represents an integer of 0 to 28,000, provided p and q are not 0 at the same time.

$$-CH_2-[-CH_2CH_2O-]_r-Ra \qquad \text{formula (4)}$$

wherein r represents 0 or an integer of 1 or more, and Ra represents a methyl group, an ethyl group, a propyl group or a butyl group.

9. The ion-conductive polymeric compound according to any one of claims 6 to 8, characterized in that the polymerizable functional group represented by Y is one or more selected from the group consisting of an acrylic residue, a methacrylic residue, an allyl group and a vinyl group.

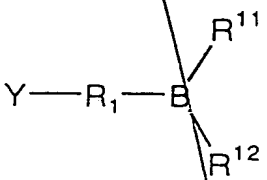
10. The ion-conductive polymeric compound according to claim 1, characterized in that the boron atom is present in a polymeric side chain.

11. The ion-conductive polymeric compound according to claim 1, characterized in that the boron atom is bound to an end of a polymeric main chain and/or a polymeric side chain as a part of a boron compound.

12. The ion-conductive polymeric compound according

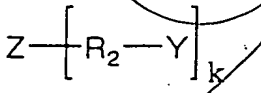
to claim 10 or 11, characterized in that the boron atom is bound to an end of a polymeric side chain as a part of a organoboron compound.

13. The ion-conductive polymeric compound according to any one of claims 10 to 12, characterized by being obtained by polymerizing a mixture of compounds represented by the following formulas (9) and (10) respectively.



(9)

wherein R_1 represents a divalent group having a molecular weight of at least 100, Y represents a polymerizable functional group, and R^{11} and R^{12}, which may be the same or different, each represent a hydrogen atom, a halogen atom or a monovalent group, or R^{11} and R^{12} are bound to each other to form a ring.



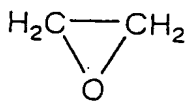
(10)

wherein R_2 represents a divalent group having a molecular weight of at least 150, Y represents a polymerizable functional group, Z represents an active hydrogen residue, and k represents an integer of 2 to 6.

14. The ion-conductive polymeric compound according to claim 13, characterized in that R_1 in general formula (9) and/or R_2 in general formula (10) is a polymer of compound (A)

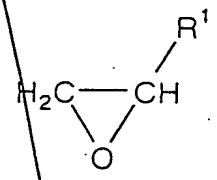
represented by the following formula (2) and/or compound (B) represented by the following formula (3).

compound (A)



(2)

compound (B)



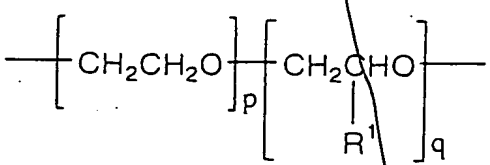
(3)

wherein R^1 represents a methyl group, an ethyl group, a propyl group, a butyl group or a group represented by the following formula (4)

$$-CH_2-[-CH_2CH_2O-]_r-Ra \qquad \text{formula (4)}$$

wherein r represents 0 or an integer of 1 or more, and Ra represents a methyl group, an ethyl group, a propyl group or a butyl group.

15. The ion-conductive polymeric compound according to claim 13 or 14, characterized in that R_1 in general formula (9) and/or R_2 in general formula (10) is a divalent group represented by the following formula



(6)

wherein R^1 represents a methyl group, an ethyl group, a propyl group, a butyl group or a group represented by

the following formula (4), p represents an integer of 0 to 38,000, and q represents an integer of 0 to 28,000, provided p and q are not 0 at the same time.

$$-CH_2-[-CH_2CH_2O-]_r-Ra \qquad \text{formula (4)}$$

wherein r represents 0 or an integer of 1 or more, and Ra represents a methyl group, an ethyl group, a propyl group or a butyl group.

16 The ion-conductive polymeric compound according to any one of claims 13 to 15, characterized in that R^{11} and R^{12} in general formula (9) are one or more selected from the group consisting of an alkyl group, an aryl group, derivatives thereof and fluorine-substituted derivatives thereof.

17. A polymeric electrolyte using one or more types of the ion-conductive polymeric compound according to any one of claims 1 to 16.

18. A polymeric electrolyte comprising one or more types of the ion-conductive polymeric compound according to any one of claims 1 to 16.

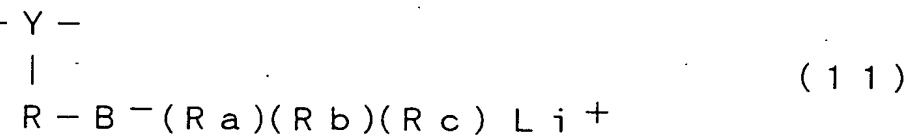
19. The polymeric electrolyte according to claim 18, characterized by further comprising a nonaqueous solvent.

20. The polymeric electrolyte according to claim 19, characterized in that the nonaqueous solvent is an aprotic solvent.

21. A polymeric electrolyte comprising a polymeric compound having a tetravalent boron atom in a polymeric

structure.

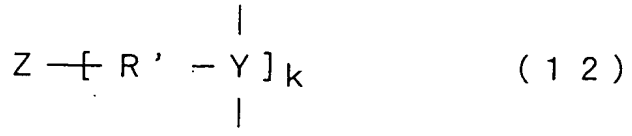
22. The polymeric electrolyte according to claim 21, characterized in that the polymeric compound has a structural unit represented by the following general formula (11) in a molecule.



(11)

wherein Y represents a residue of a polymerizable functional group, R represents a group capable of being bound to the polymerizable functional group and the boron atom and having a molecular weight of at least 40, and Ra, Rb and Rc, which may be the same or different, each represent a group capable of being bound to the boron atom.

23. The polymeric electrolyte according to claim 22, characterized in that the polymeric compound is a copolymer further having a structural unit represented by the following general formula (12)



(12)

wherein Y represents a residue of a polymerizable functional group, Z represents a residue of an active hydrogen compound, R' represents a divalent group having

a molecular weight of at least 150, and k represents an integer of 2 to 6.

24. The polymeric electrolyte according to any one of claims 21 to 23, which further comprises an aprotic solvent.

25. The polymeric electrolyte according to any one of claims 21 to 24 which further comprises an electrolytic salt.

26. The polymeric electrolyte according to claim 18 or 25, characterized in that the electrolytic salt is a lithium salt.

27. The polymeric electrolyte according to claim 26, characterized in that the lithium salt is one or more selected from the group consisting of $LiBF_4$, $LiPF_6$, $LiClO_4$, $LiAsF_6$, $LiCF_3SO_3$, $LiN(CF_3SO_2)_2$, $LiN(C_2F_5SO_2)_2$, $LiC(CF_3SO_2)_3$, LiCl, LiF, LiBr, LiI, derivatives thereof.

28. The polymeric electrolyte according to claim 20 or 24, characterized in that the aprotic solvent is one or more selected from the group consisting of carbonates, lactones, ethers, sulfolanes and dioxolanes.

29. An electric device using the polymeric electrolyte according to any one of claims 17 to 28.

30. A cell in which a positive electrode and a negative electrode are linked through the polymeric electrolyte according to any one of claims 17 to 28.

31. The cell according to claim 30, characterized in that the positive electrode is made of a double metal oxide

capable of occluding and releasing lithium ions, and the negative electrode is made of a lithium metal, a lithium alloy or a compound capable of occluding and releasing lithium ions reversibly.